CORRSYS DATRON Sensorsysteme GmbH

DCA System

Sensor System

for

Dynamic Camber Angle Measurement

USER MANUAL VOLUME I

Sensor Hardware

Note: For a general description of the CeCalWin Pro Software refer to the separate user manual Volume II.

For the specific software description for the DCA-System Sensor refer to the separate user manual Volume III.

VOLUME I - Sensor Hardware

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Safety Instructions

Please read carefully before operating the equipment.

CORRSYS-DATRON is not responsible for damage that may occur when this system is used in any way other than that for which it is intended.

To assure safe and proper operation, all supplied equipment, components and/or accessories must be carefully transported and stored, as well as professionally installed and operated. Careful maintenance and usage in full accordance with operating instructions is imperative.

CORRSYS-DATRON equipment should be installed and operated only by qualified persons who are familiar with devices of this type.

Local regulations may not permit the operation of motor vehicles on public highways while the equipment is mounted on the exterior of the vehicle.

- Use the equipment only for intended applications. Improper application is not advised.
- Do not modify or change the equipment or its accessories in any way.
- Improper use or mounting of the equipment may affect the safety of the vehicle and/or occupants.
- The equipment must not be mounted and/or operated in any way that may compromise vehicle and/or occupant safety.
- Equipment must be mounted firmly and securely.
- Use only original equipment, components and/or accessories included in the scope of delivery.
- Do not use defective or damaged equipment, components and/or accessories .
- Always note correct pin assignments and operating voltages when connecting equipment to power supplies, data acquisition/evaluation systems, and/or any other applicable system or component. Equipment may be damaged if not properly connected and/or operated.
- For additional information, please call the CORRSYS-DATRON Hotline: ++49 (6441) 9282-82 or email: hotline@corrsys-datron.com.

- **Caution:** Laser radiation is emitted from this device!
  Do not stare into beam!
  Laser class 3R according to DIN EN 60825-1:2001-11

- Disconnect power from the sensor if the vehicle is stationary for extended periods.

1. Overview

DCA System

Sensor System

for

Dynamic Camber Angle Measurement

Article no.:

DCA-1 System for camber angle measurement at one wheel	**15905**
DCA-2 System for camber angle measurement at two wheels	**15906**
DCA-System for camber angle measurement without processor	**15907**

Dynamic Camber Angle Measurement

Using two CORRSYS-DATRON HF-500C or HF-750C Ride Height Sensors mounted on the vehicle wheel, accurate dynamic measurement of wheel camber relative to ground is at last a reality.

This ingenious new system acquires dynamic wheel camber angle by comparing the relative change in height between the two sensors, as measured from the optical plane of each sensor to the surface of the road or track.

The system also provides the option to mount CORREVIT® SFII-P Sensor for non-contact measurement of speed/slip angle

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Features

- Measures camber angle relative to ground
- Mounts easily onto the vehicle wheel with collets that clamp directly to the wheel nuts. Collets are available for most standard wheel types
- Universal application
- Online display via CeCalWin Pro Software
- Parameterization via CeCalWin Pro Software
- DCA Processor supports one or two sensor systems
- Data output via CAN, USB, and analog output
- Optional mounting of a CORREVIT® SFII-P Sensor for non-contact measurement of slip angle
- For passenger cars and SUVs
- Truck version available on request.
- Uses two CORRSYS-DATRON HF-500C or HF-750C Laser Height Sensors, proven accurate in extreme environmental conditions, including intense sunlight, and high temperature and humidity, as found in India and Arizona.

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2. Extent of Delivery

Standard extent of delivery, article no. 15905
DCA-1 System for camber angle measurement at one wheel without collets and centering stars

1. 14582 (1) Wheel mounting complete RV4 and DCA
2. 15237 (1) Mounting HF for DCA system without sensors
3. 13195 (1) Bar double hub for SL wheel mounting unit and WPT (top)
4. 11290 (1) Hexagon wrench set SW2-8
5. 15380 (2) pcs HF-500C with CAN *
6. 15232 (1) Sensor cable 5m DCA Processor - 2x HF-Sensors
7. 14892 (1) Processor for DCA system
8. 10397 (1) Power cable 5m B-coded 4pin, Banana plug
9. 13946 (1) Can cable 2m 3pin Binder 9pin, Sub-D
10. 13425 (1) RS232 cable 2m 4pin Binder -> 9pin, Sub-D
11. 13947 (1) USB cable 2m ->4pin Binder
12. 14977 (1) Distributor cable 1m HD-SUB - 5xBNC DCA
13. 11343 (1) Software, CeCalWin Pro
14. 11428 (2) Calibration according to DIN EN ISO 9001, Manufacturer Certificate "M" according to DIN 55350 part 18 for all 1-axis sensors

Standard extent of delivery, article no. 15906
DCA-2 System for camber angle measurement at two wheels without collets and centering stars

1. 14582 (2) Wheel mounting complete RV4 and DCA
2. 15237 (2) Mounting HF for DCA system without sensors
3. 13195 (2) Bar double hub for SL wheel mounting unit and WPT (top)
4. 11290 (1) Hexagon wrench set SW2-8
5. 15380 (4) pcs HF-500C with CAN *
6. 15232 (2) Sensor cable 5m DCA Processor - 2x HF-Sensors
7. 14892 (1) Processor for DCA system
8. 10397 (1) Power cable 5m B-coded 4pin, Banana plug
9. 13946 (1) Can cable 2m 3pin Binder 9pin, Sub-D
10. 13425 (1) RS232 cable 2m 4pin Binder -> 9pin, Sub-D
11. 13947 (1) USB cable 2m ->4pin Binder
12. 14977 (2) Distributor cable 1m HD-SUB - 5xBNC DCA
13. 11343 (1) Software, CeCalWin Pro
14. 11428 (4) Calibration according to DIN EN ISO 9001, Manufacturer Certificate "M" according to DIN 55350 part 18 for all 1-axis sensors

* alternatively, the DCA System can be equipped with two HF-750C Sensors (art.no. 15914)

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Standard extent of delivery, article no. 15907
DCA System for camber angle measurement at one wheel without processor, collets and centering stars

1. 14582 (1) Wheel mounting complete RV4 and DCA
2. 15237 (1) Mounting HF for DCA system without sensors
3. 13195 (1) Bar double hub for SL wheel mounting unit and WPT (top)
4. 11290 (1) Hexagon wrench set SW2-8
5. 15380 (2) pcs HF-500C with CAN
6. 11343 (1) Software, CeCalWin Pro
7. 11428 (2) Calibration according to DIN EN ISO 9001, Manufacturer Certificate "M" according to DIN 55350 part 18 for all 1-axis sensors

* alternatively, the DCA System can be equipped with two HF-750C Sensors (art.no. 15914)

Options / Accessories

- Wheel Incremental Transducer including mounting accessories and cables, article no. 14907
  Transducer with mounting equipment for RV-4 and DCA
- CORREVIT® SF Sensor (standard extent of delivery and mounting accessories)
  Article no. 14391 - SFII P and article no. 14623 = mounting accessories (bracket) SFII P Sensor for DCA System

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3. Technical Data

3.1 Technical Specifications

Sensor position relative to wheel center:	62 ... 195 mm
Working distance and range:	HF-500C: 125 ... 625 mm / HF-750C: 150 ... 900 mm
Max. wheel diameter:	≤ 800 mm
Max. measuring range, camber angle*:	±25°
Resolution, camber angle*:	0.04°
Accuracy, camber angle*:	<0.5°
Moving mass at the wheel:	approx. 3.4 kg
Light source:	Laser, 660 nm (red), < 5 mW
Laser class:	3R (IEC 60825-1)
Approx. spot size:	1 mm x 2 mm
Collets (optional):	17, 19, and 21 mm 14, 20, 22, 23, 24, 26, 27, and 30 mm (other sizes available upon request)

*values based on a basis length of 162 mm

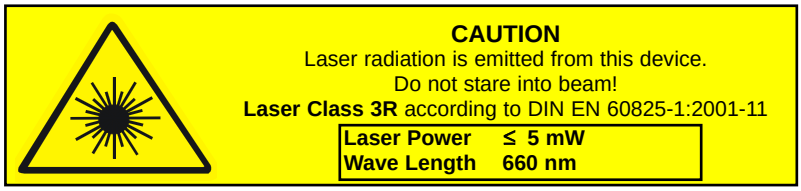
System Specifications

Power supply:	10 ... 36 V DC
Supply current:	< 0.5 A
Temperature range:	
Operating:	-10 … 50°C
Storage:	-20 … 60°C
System protection of the sensors:	IP 65
System protection of the processor:	IP 55

Outputs

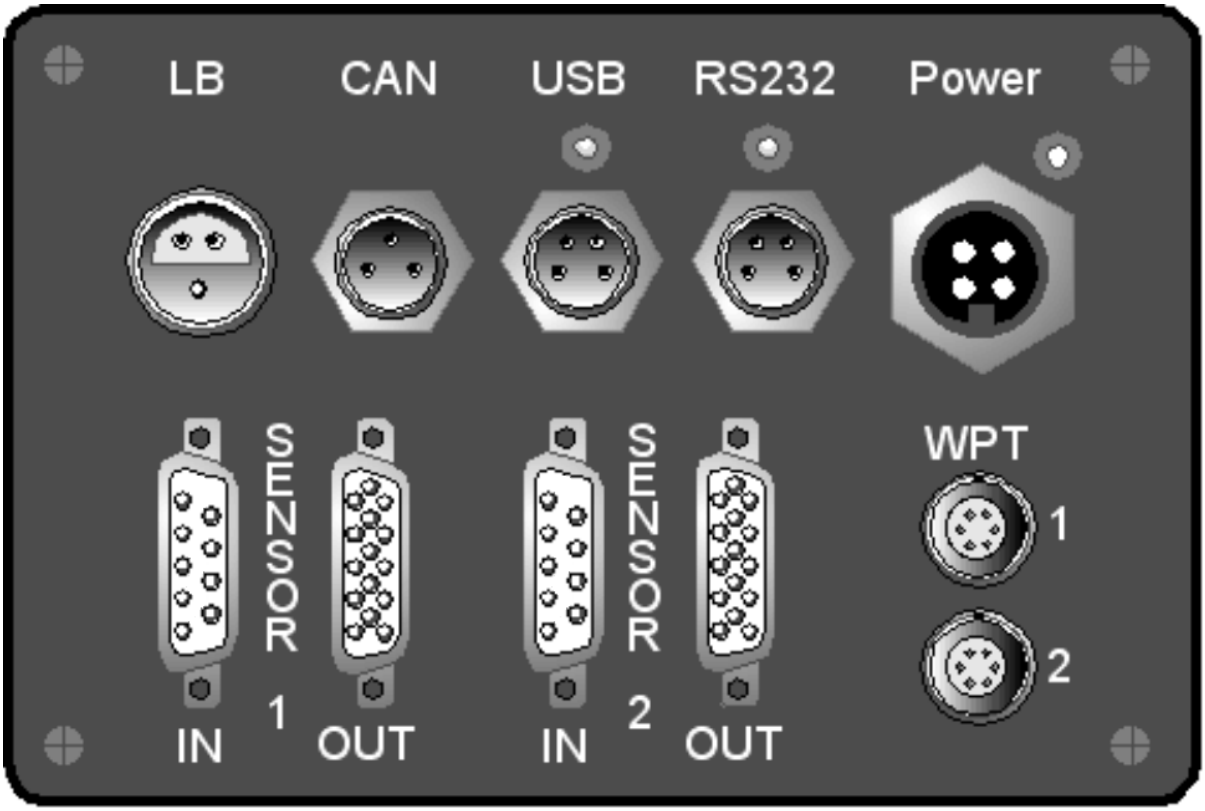
Output signals:	Camber Angle Height 1, Height 2 Wheel Speed**, Wheel Position** Calculated Distance**
Update rate:	4 ms (250 Hz)
CAN Bus:	CAN V2.0B - switchable terminating resistor (Intel or Motorola Format)
Analog Outputs:	±10V each (16 bit resolution)
PC interface:	USB 2.0 full speed and RS232
Adjustable filter time:	unfiltered or 4 ... 512 ms

All inputs and outputs are protected against overvoltage and short circuit.

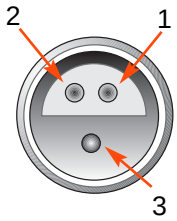

CAUTION
Laser radiation is emitted from this device.
Do not stare into beam!
Laser Class 3R according to DIN EN 60825-1:2001-11
Laser Power ≤ 5 mW
Wave Length 660 nm

**optional, with Wheel Pulse Transducer Art.no. 11355

3.2 Pin Assignments

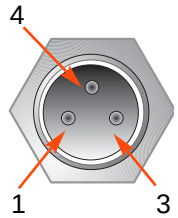


ATTENTION!
All views are of the front of the connector.



Light Barrier 3-pin Lemo, Series 1S

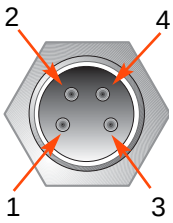
Pin 1: light barrier signal
Pin 2: GND
Pin 3: +12V



CAN 3-pin Binder 718 flange connector, male

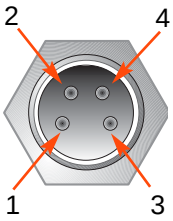
Pin 1: CAN high
Pin 3: CAN low
Pin 4: CAN GND

ATTENTION!
All views are of the front of the connector.



USB 4-pin Binder 718 flange connector, female

Pin 1: D+
Pin 2: D-
Pin 3: DGND
Pin 4: Switch

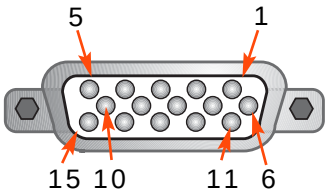


RS-232 4-pin Binder 718 flange connector, male

Pin 1: TXD
Pin 2: RXD
Pin 3: GND
Pin 4: n.c.

Power AMP-4M-V

Pin 1: +12 V
Pin 2: +12 V
Pin 3: GND
Pin 4: GND

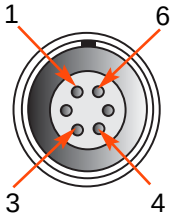


Sensor 1 & 2 Out 15-pin HDSub, female

Pin 1: Camber, analog
Pin 2: n.c.
Pin 3: H1, analog (height sensor 1)
Pin 4: n.c.
Pin 5: n.c.
Pin 6: H2,analog (height sensor 2)
Pin 7: n.c.
Pin 8: Velocity, analog
Pin 9: n.c.
Pin 10: AGND
Pin 11: n.c.
Pin 12: DGND
Pin 13: Velocity, digital
Pin 14: n.c.
Pin 15: n.c.

Sensor 1 & 2 In 9-pin HDSub, female

Sensor 1 & 2 Inputs should not be changed by the user.



WPT 1 & 2 6-pin Lemo, Series 1S, female

Pin 1: Pulse WPT
Pin 2: Zero Pulse WPT
Pin 3: +5 V
Pin 4: +12 V
Pin 5: DGND
Pin 6: n.c.

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4. Set-up and Connection

4.1 Standard Mounting

1. Select the following parts:

2. Remove hubcap or any covering over wheel nuts and clean dirt/debris from wheel nuts. If the collet clamps have been separated from the barrels (as shown above), place the clamps inside the barrels, then place the mounting collets firmly onto the wheel nuts. Also be sure that the retainer screws and washers have been removed prior to beginning Step 3.

3. Align the mounting disc.

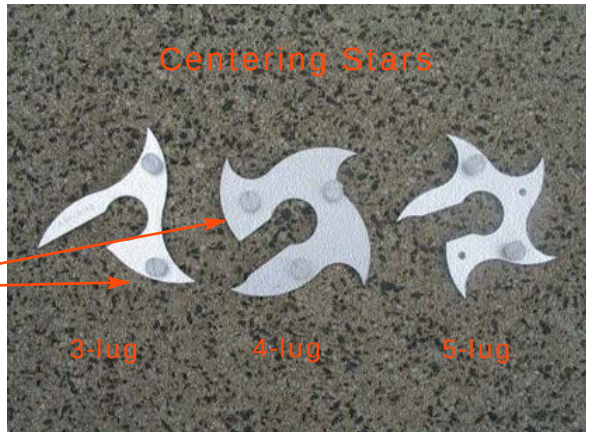
   NOTE: Each mounting slot on the disk is marked to ensure proper alignment with 3-, 4-, and 5-lug configurations.

Mounting slot
The markings indicate that this slot is for 3-, 4- and 5-lug configurations.
The markings indicate that this slot is for 3- and 4-lug configurations.

4. Affix the mounting disk to the collets with mounting bolts and washers. Do not fully tighten the mounting bolts at this step!

5. Select the centering star that corresponds to the lug configuration (3x, 4x, or 5x) of the wheel on which the sensor will be mounted.

   NOTE: Each centering star is fitted with nylon knobs, which facilitate positioning and serve as leverage points.



6. Slide the centering star onto the mounting disk hub and press the centering star firmly against the mounting disk. Next, turn centering star so that its concave edges rest firmly against the washers on the mounting bolts. Then, apply pressure to the positioning knobs on the centering star, as shown, until it is tight against all of the washers. Screw the bolts slightly using a 5 mm allen wrench and then tighten them firmly with a 12 Nm torque wrench.
   This will ensure that the mounting disk is properly centered on the wheel. Continue to hold the centering star tightly against the mounting washers and mounting disk, then tighten the mounting bolts in a cross pattern.

7. Using an allen wrench, loosen the set screw at the bottom of the torsion rod retainer clamp and place the retainer clamp onto the mounting hub.

   NOTE: The set screw should not be tightened until the torsion rod is properly positioned. (See Step 10 on page 15)

8. To assure proper function of the suction holders, the mounting area must be free of grease, oil, dust and other contaminants. For this reason it it is necessary to clean the painted surface in the mounting area before attaching the suction holders. Do not use cleaning products that leave residue of any kind on the surface. Place the suction holders firmly against the vehicle fender and latch the suction holder lock handles (latched position is approximately parallel to vehicle fender surface).

   When producing the vacuum, you will feel a distinct resistance.

9. Check the safety line to be sure it is secured to the torsion rod. Secure the safety line at a suitable location on the vehicle, e.g. an additional suction holder (optional) as shown at right.

   A safety line should always be used to avoid damage or injury in the event that a suction holder separates from the vehicle body during the test drive.

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10. Tighten the retainer clamp set-screw with an allen wrench (size 5).

11. Check to be certain that the HF-xxxC Height Sensors are securely affixed to the DCA mounting bracket.

12. Attach the DCA mounting plate on the mounting hub and adjust parallel to the ground using the built-in water level.

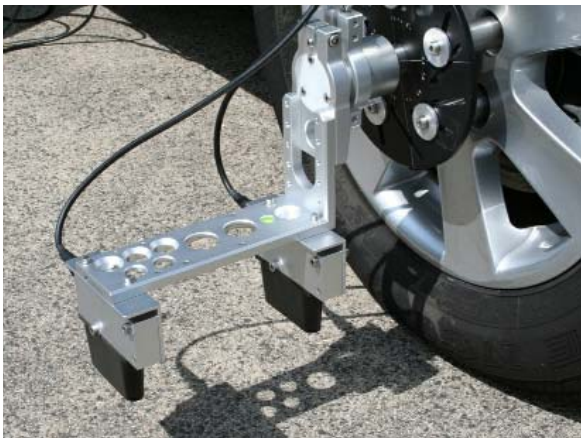
Please pay attention that the sensors are mounted within the specified working distance (see page 10) during the measurement.
The mounting bracket can be adjusted up or down on the mounting hub to achieve the specified sensor operating range.

13. Tighten the mounting plate set screw with an allen wrench (size 5)

14. Connect the signal cables to the sensors.

15. A properly mounted DCA System with two HF-xxxC Sensors is shown at right.

For measurement of tire slip angle, the DCA System can be fitted with an optional CORREVIT® SFII-P Sensor. (See section 4.2 Mounting a CORREVIT® SF-II P Sensor page 19).



4.2 Mounting a CORREVIT® SF-II P Sensor

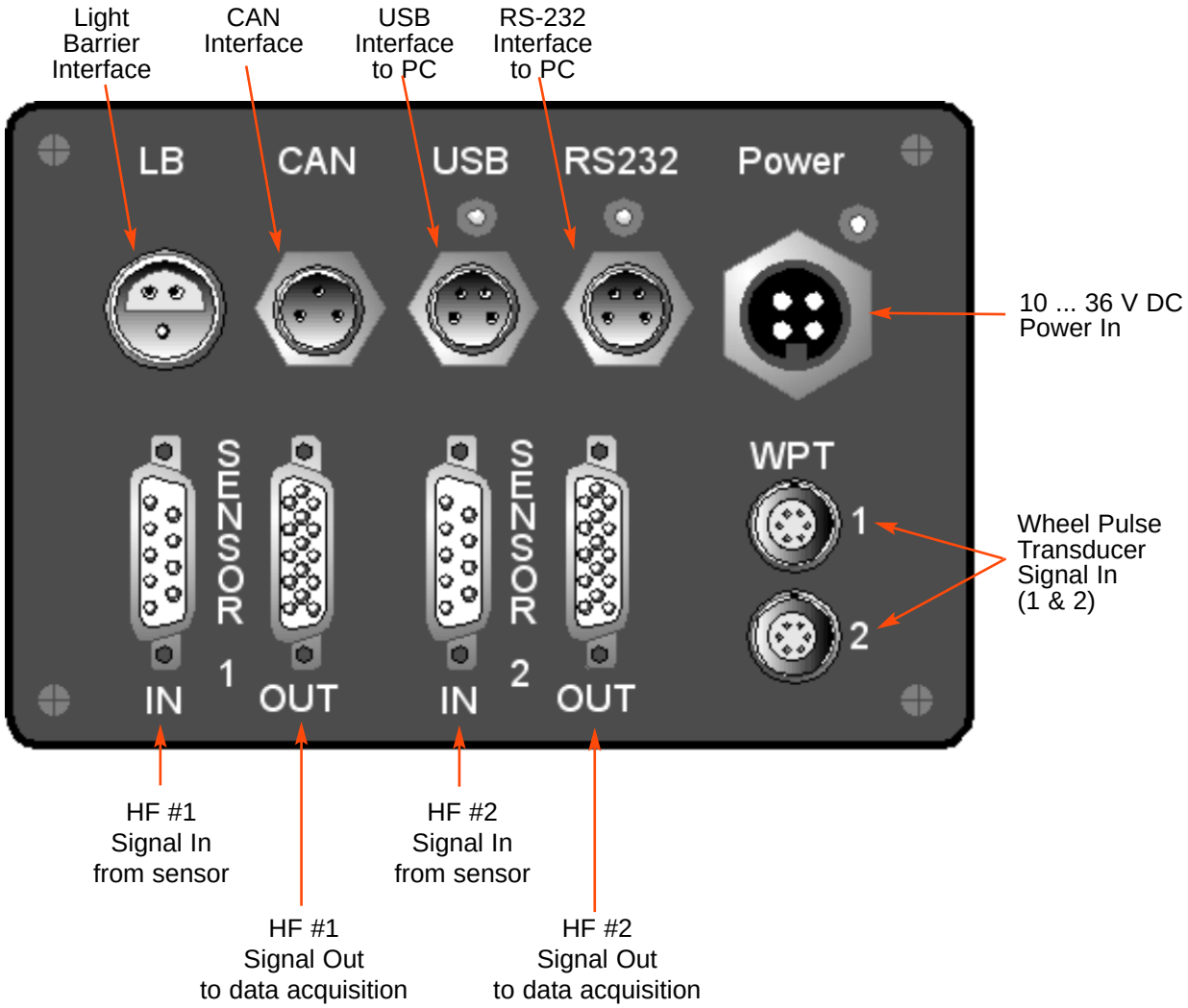
CORREVIT® SF-Series Sensors can be used in conjunction with the DCA System for acquisition of speed, distance and angle data.

1. Secure the SFII-P Sensor to the mounting plate for SF Sensors on DCA mounting bracket.

2. Tighten the mounting screws with an allen wrench and connect the signal cable to the sensor.

3. The illustration shows the mounting of a DCA System with two HF-xxxC Sensors and an additional SFII-P Sensor.

4.3 Connecting the DCA Processor Unit



5. Troubleshooting

When troubleshooting the DCA Sensor System begin by checking the following:

Cables and power supply

- Check all connections to determine that each is complete and that the system is connected to a power supply that provides voltage output within the specified range.
- Check to determine that the correct cables have been used for all connections.
- The following problems can be caused by incorrect or incomplete cable connections and/or connection to incorrect power supply voltage:
  - Output signals are not available to data acquisition and/or connected PC.

Operating range

If the sensor is mounted out of the recommended height range (standoff distance), no measurement signals will be output. Check and correct mounting as necessary.

Sensor lens

The sensor lens (located on the underside of the sensor housing) may occasionally become dirty, preventing proper operation. Check and clean the sensor lens regularly.

Software

If the output signal appear to be incorrect, the sensor may have been set-up incorrectly via CeCalWin Pro Software. Check all relevant settings in CeCalWin Pro.

Environmental conditions

The sensor may occasionally interpret heavy spray from snow or water as part of the road or track surface, producing unexplained spikes in the output signals and/or other anomalous measurement artifacts. Sensors should be mounted away from the heaviest spray areas, especially directly behind the rear wheels.

If none of the above recommendations provides a solution, you may wish to contact CORRSYS-DATRON. Before doing so, please be ready to supply the following:

- A *.ccw file saved from CeCalWin Pro Software to serve as an example of the problem or fault condition.
- The serial numbers of all relevant components.

Note: With the DCA System you have purchased a premium, high-precison product. To assure continued optimum performance, we recommend that you send it to CORRSYS-DATRON once per year for inspection, maintenance, and calibration."